FPT
POWERTRAIN TECHNOLOGIES

ePOWERTRAIN

Our efficiency.
Your edge.

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ABOUT FPT INDUSTRIAL

FPT Industrial is a Brand of Iveco Group, dedicated to the design, production, and sale of powertrains and solutions for on- and off-road vehicles, as well as marine and power generation applications.
At FPT Industrial sustainability is a common underlying commitment, through the entire product development and as a corporate approach.

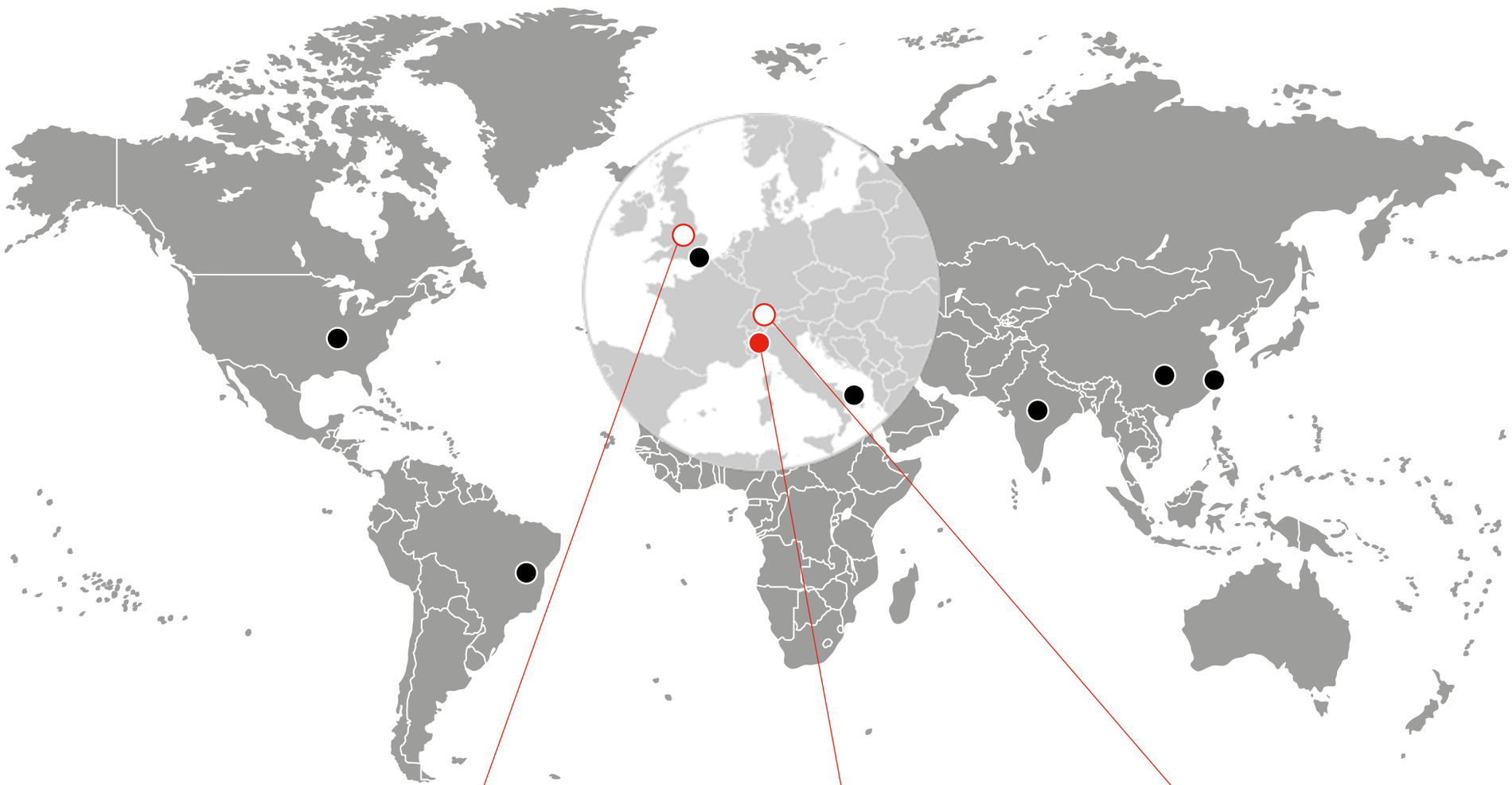
The extensive product offering includes six engine ranges with power outputs from 30 hp to over 1,000 hp, transmissions with torque up to 500 Nm and front and rear axles from 2.45 to 32 tonne GAW (Gross Axle Weight).

FPT Industrial offers the most complete line-up of natural gas engines for on- and off-road applications on the market, with power outputs ranging from 50 to 520 hp.

A dedicated ePowertrain division is accelerating the path towards net zero-emissions mobility with electric drivelines, battery packs and battery management systems. This extensive offering and its strong focus on R&D makes FPT Industrial a world leader in industrial powertrains and solutions.

We are proud to be a Company driven by sustainability and innovation, one which builds Customer advantage through continuous research and improvement and creates value by leveraging this advantage.

ePOWERTRAIN R&D FOOTPRINT



3 ePOWERTRAIN R&D CENTERS
OUT OF 10 WORLDWIDE

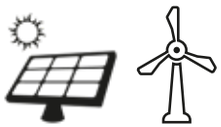
COVENTRY, UK
Potenza
BMS Design Center

TURIN, ITALY
Main Powertrain Engineering
Development Center at system level
Testing Center

ARBON, SWITZERLAND
Innovation Center Cells & Modules
R&D Center

FPT Industrial
Turin ePowertrain Plant & Testing Center: 100% Electric and Zero CO_2 Emissions

Totally carbon-neutral plant, with more than 5 dedicated ePowertrain test benches, offsetting its CO_2 emissions by purchasing energy from renewable sources and through carbon credits.



Solar panels installed on the façade **and innovative technologies** such as the "mini-wind tower" and the "smart flower" **generate energy for plant activities.**

The Sustainability Garden: 6,000 square meters of internal space planted with 100 drought-resilient plants of native species **with great CO_2 absorption capacity.**

FPT Industrial
Turin Site: More Than 15,000 Square Meters Dedicated to Electrification

The FPT Industrial ePowertrain plant features four production lines dedicated to the production of its new eDriveline products and Battery Storage, available in ten variants.

Central Drive
Light Commercial Vehicles and Minibus up to 7.2t GVW

37 kWh Battery Pack
Light Commercial Vehicles and Minibus

69 kWh Battery Pack
Bus and Coach Applications

Rear eAxle
Heavy Commercial Vehicles up to 49t GCVW

Front + Rear eAxles
High-performance Cars

PRODUCT PORTFOLIO

FPT Industrial is responding to the crucial challenges of transport sustainability, energy transition and the reduction of CO_2 emissions with a complete range of innovative products.

Being a global leader means setting new targets that become more challenging every day. To reach these targets, we have drawn on our expertise along with the best innovative start-ups worldwide, through partnerships, acquisitions and joint ventures.

Now, we can proudly present the results, showcasing our full range of eDriveline, Battery Storage and Battery Management System solutions.

In response to Customer needs, the objective of FPT Industrial is not only to supply individual system components but to serve as an ePowertrain system integrator, guiding its Customers through the process of selecting, designing and correctly sizing complete systems for battery and fuel cell electric vehicles.

eAxles

eAX 300-F

eAX 600-R

eAX 145-R

eAX 375-R

eAX 840-R

CENTRAL DRIVE

eCD 140

ENERGY STORAGE

eBS 37 - eBS 37 EVO

eBS 42

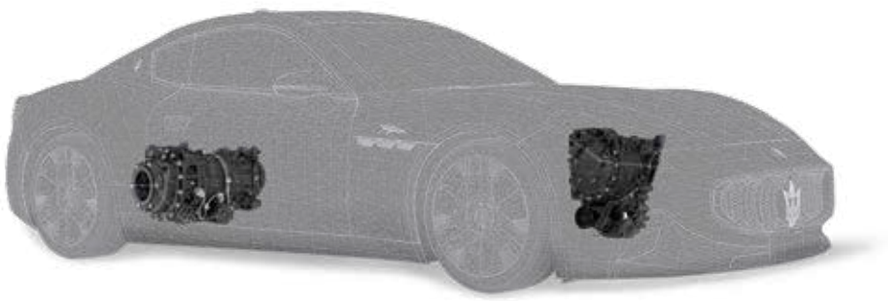
eB6 69

BATTERY MANAGEMENT SYSTEM

eBM 5

HIGH-PERFORMANCE PASSENGER CARS

eAX 300-F
eAX 600-R



Complete, compact and fully integrated solutions for the highest levels of power density.

High-performance Cars

>300 kW (Front) | >600 kW (Rear)

Performance
Top level power density thanks to a high-efficiency system.

Compact Design
Complete, compact and integrated design to maximize weight and installation space.

Tailor-made
Jointly developed by FPT Industrial and Maserati for the brand-new GranTurismo Folgore.

FPT Industrial and Maserati have worked closely together for the new Maserati GranTurismo Folgore, the first car in the Brand's history to adopt a 100% electric powertrain.
The jointly developed eAxles deliver top levels of power density (up to 4.83 kW/kg) and a high level of performance thanks to the torque vectoring system.

The eAX 300-F front electric axle boasts a peak power output of over 300 kW and maximum wheel torque of 3,100 Nm. It also incorporates a parking lock system for enhanced safety.
The eAX 600-R dual-motor rear electric axle features peak power of over 600 kW and maximum wheel torque of 6,500 Nm.

Both eAxles stand out as a complete solution in an extremely compact design. All components, including the inverters, are perfectly integrated into the eAxles. This offers significant benefits in terms of space and weight distribution.

Specifications:

	eAX 300-F	eAX 600-R
Type:	Front Axle	Rear Axle
No. of eMotors:	1	2
Peak Power (kW):	>300	>600
Peak Wheel Torque (Nm):	3,100	6,500
DC Voltage (V):	Up to 800	Up to 800
System efficiency:	>85%	>85%
Weight (kg):	100	160
Power Density (kW/kg):	Up to 3.86	Up to 4.83
Gear – speeds:	1	1
Durability Be10 (km):	Up to 240,000	Up to 240,000

LCVs AND MINIBUSES

eAX 145-R

Fully integrated solutions for CO_2-free logistics.

LCV

Up to 145 kW

GVW up to 10 tons

Layout:
Adaptable layout to meet various powertrain needs.

Vehicle application:
Designed to easily replace traditional powertrains.

The eAX 145-R is an innovative electric axle prototype designed for commercial vehicles, underlining our strong commitment to research and development.

Our design team has created a compact system that brings together all the components of an electric driveline: this ensures outstanding performance and efficiency (over 92%) while maintaining the utmost reliability.

The eAX 145-R can seamlessly replace traditional powertrain systems on standard platforms, reducing the need for extensive modifications. With our engineering expertise, this project can be customized in various ways.

The initial version of this prototype was developed within the SYS2WHEEL project, with support from the European Commission's H2020 program.

Specifications (prototype):

Type:	Rear Axle
No. of eMotors:	2
Peak Power (kW):	145
Peak Wheel Torque (Nm):	6,400
GAW (ton):	7
GVW (ton):	10
System efficiency:	>92%
Brake system:	DISC
Braking power of discs (Nm):	11,000
Weight (kg):	350
Gear – speeds:	1
Gear ratio:	11
Durability Be10 (km):	up to 400,000

eCD 140

Integrating an electric drive system into existing conventional vehicles.

LCV - Minibus

Up to 140 kW

GVW up to 8 tons

Durability:
Maximum durability (Be10) up to 350k km for CVW <8-ton.

Easy integration:
Matching with available rear axles into existing platforms.

High efficiency:
Overall system efficiency: >93%.

The FPT Industrial Central Drive eCD 140 for LCV and Minibus applications is a compact and complete solution for integrating electric drive systems into existing conventional vehicles. The FPT Industrial engineering team has designed a lean, integrated central drive system in order to guarantee easy integration into existing platforms.

For rear-wheel drive applications, as with all FPT Industrial products, the eCD 140 is extremely durable, efficient and reliable (up to 350,000 km, with lifetime oil fill).

Specifications:

No. of eMotors:	1
Peak Power (kW):	up to 140
Peak Axle Torque (Nm):	1,600
GAW (ton):	<8
System efficiency:	>93%
Weight (kg):	117
Gear – speeds:	1
Gear ratio:	4
Durability Be10 (km):	up to 350,000

eBS 37 and eBS 37 EVO

Battery Pack for zero-emission urban mobility.

LCV - Minibus

Up to 37 kWh

Multipack solution:
High flexibility thanks to multipack solution.

High energy density:
>140 Wh/kg to guarantee maximum performance and optimize weight and installation space.

Proprietary Battery Management System:
In-house HW & SW BMS to achieve a long battery life according to mission requirements.

The 37 kWh FPT Industrial Battery Pack for LCV and Minibus applications is a modular battery pack which incorporates cells and modules with unique Lithium-ion technology for impressive energy density and depth-of-discharge (95%), with advantages in terms of reduced battery weight.

The new eBS 37 EVO battery presents some substantial innovations: the eBM 5 Battery Management System - developed and produced entirely by FPT Industrial - and a new internal design which allows the battery to meet the highest safety standard ECE R100.3.
Thanks to the FPT Industrial in-house Battery Management System eBM 5, the eBS 37 EVO has a long battery life according to mission requirements.

Specifications:

	eBS 37	eBS 37 EVO
Type:	Battery Pack	
Cell Technology:	Li-ion	
Cooling system:	Water-cooled	
Nominal energy (kWh):	37	
Energy density (Wh/kg):	>140	
C-rate (continuous):	1C (charge) 2C (discharge)	
Cathode technology:	NMC	
Protection:	IP67 / IP6K9K	
Life cycles:	>2,500	
Weight (kg):	260	
Regulation compliance:	ECE R100.2, ECE R10.5	ECE R100.3, ECE R10.6
BMS	Microvast	FPT Industrial eBM 5

eBM 5

BMS
Battery Management System

CMC-36
Cell Monitor Circuit

Cutting-edge Battery Management System.

LCV - Minibus

Flexibility:
Highly Flexible, designed according to Customer and mission needs.

Battery optimization:
With improved battery capacity and life thanks to cells and modules which balance the controls.

Enhanced safety and performance:
Advanced BMS algorithms.

Cloud backup storage

The FPT Industrial eBM 5 Battery Management System is a cutting-edge solution, designed to meet the needs of the most demanding Customer. eBM 5 enhances safety, accuracy and performance.

Thanks to its advanced algorithms, the eBM 5 ensures battery protection, improving its capacity and life. Furthermore, thanks to its cells and modules which balance the controls, the eBM5 optimizes the driving range.

eBM 5 also meets ASIL C integrity in accordance with ISO26262 - already certified.

Specifications:

High Voltage range (V):	400 and 800V system compatible
Low Voltage range (V):	6 to 32
Isolation Fault Measurement (MΩ):	1 to 10
Operating Temperature (°C):	-40° to +85°
Safety measurements:	ISO26262 (ASIL C) Isolation test, HVIL &HV Cyber Security
Software - multipack support:	1-9 packs in parallel
Cell balancing:	Passive
SOx Algorithms:	SOC, SOH & SOP

MEDIUM & HEAVY-DUTY VEHICLES AND BUSES

eAX 375-R

High-performance and efficient solution designed for Medium and Heavy-Duty Commercial Vehicles, Intercity and Coach applications.

MCV 4x2 & 6x2
Up to 375 kW
GVW up to 29 tons

HCV 6x4
Up to 375 kW x2
GVW up to >49 tons

Intercity & Coach
Up to 375 kW

Scalable solution:
Scalable and adaptable to meet various powertrain requirements.

Durability:
Extended service life (Be10) up to 1,600,000 km (depending on the customer and vehicle mission profile).

Braking torque:
Disc brake system with high braking torque performance.

The eAX 375-R is suitable for Medium and Heavy-Duty vehicles, Intercity and Coach applications.
Thanks to two-speed gearing and a brand-new design, the eAX 375-R delivers high performance, outstanding efficiency and extended durability.
The design, developed by FPT Industrial's engineering team, allows the electric axle to be scalable and extremely adaptable to meet the needs of different Customers.

Specifications (pilot phase):

Type:	Rear Axle
No. of eMotors:	1
Peak Power (kW):	375
Peak Wheel Torque (Nm):	30,000
GAW (ton):	up to 13
GVW (ton):	29 (medium) | >49 (heavy)*
System efficiency:	>92%
Brake system:	DRUM/DISC
Weight (kg):	600 (without brakes and wheel ends)
Gear – speeds:	2
Durability Be10 (km):	up to 1,600,000*

* depending on vehicle mission profile

eAX 840-R

Designed for the Heavy-Duty Commercial Vehicles market.

HCV 4x2 & 6x2

Up to 420 kW x2

GVW up to 44 tons

Performance:
High-performance, high-efficiency electric axle for heavy-duty truck applications.

Integrated layout:
All the mechanical and electrical components are integrated into a lean axle structure, in order to maximize residual vehicle space following installation.

Designed, engineered and launched in just two years, the eAX 840-R has the potential to make a significant impact on the global electric Heavy-Duty Commercial Vehicle market.

Designed for the US market, now also available in the European Variant, the eAX 840-R is a dual-eMotor axle for vehicles up to 44 tons GVW which guarantees high performance and efficiency, reliability and low Total Cost of Ownership (TCO). It boasts extended oil change intervals and a rated service lifetime of up to 1,200,000 km.

Specifications:

Type:	Rear Axle
No. of eMotors:	2
Peak Power (kW):	840
Peak Wheel Torque (Nm):	45,000
GAW (ton):	13
GVW (ton):	44
System efficiency:	>92%
Brake system:	DISC
Braking power of discs (Nm):	30,000
Weight (kg):	1,360
Gear – speeds:	1
Gear ratio:	from 15 to 25
Durability Be10 (km):	up to 1,200,000

eBS 69

Battery Pack for zero-emission people transport.

Bus

Up to 69 kWh

Multipack solution:
High flexibility thanks to multipack solution.

Best-in-Class energy density:
>178 Wh/kg to guarantee maximum performance and optimize weight and installation space.

Life Cycles:
>6,500 depending on the specific mission.

Warranty:
Up to 10 years warranty according to the mission profile.

The 69 kWh FPT Industrial Battery Pack for bus applications is a modular battery pack which incorporates cells and modules with unique NMC Lithium- ion technology for best-in-class energy density which offers highest performance in City bus applications.

Its customized Battery Management System, ensures a long battery life and incorporates specific safety and cyber-security features for bus applications.

Furthermore, the eBS 69 battery pack has been specifically designed to fit perfectly on bus applications.

Specifications:

Type:	Battery Pack
Cell Technology:	Li-ion
Cooling system:	Water-cooled
Nominal energy (kWh):	69
Energy density (Wh/kg):	>178
C-rate (continuous):	1C (charge) 1C (discharge)
Cathode technology:	NMC
Protection:	IP67 / IP6K9K
Life cycles:	>6,500
Weight (kg):	388
Regulation compliance:	ECE R100.2, ECE R10.6
BMS:	Microvast

CONSTRUCTION & AGRICULTURAL APPLICATIONS

eBS 42

Battery Pack for zero-emission off-road applications.

Construction equipment and agricultural applications

Up to 42 kWh

Multipack solution:
High flexibility thanks to multipack solution.

Fast charge / discharge:
High C-rate (continuous) for fast charging & discharging times.

High energy density:
To guarantee maximum performance and optimization in terms of weight and installation space.

Enhanced safety standards:
Specific safety features compliant with new regulations.

The 42 kWh FPT Industrial Battery Pack for off-road applications is a modular battery pack which incorporates Microvast cells with unique Lithium-ion technology for impressive energy density and depth-of-discharge (95%), along with advantages in terms of reduced battery weight.

The eBS 42 also delivers quick charging times thanks to NMC technology (Lithium Nickel Cobalt Manganese), the most versatile and high-performance solution to date for commercial vehicle applications. Furthermore, this advanced, well-designed energy storage system guarantees high levels of energy density and outstanding stability.

Specifications:

Type:	HV Battery Pack
Cell Technology:	Li-ion
Cooling system:	Water-cooled
Nominal energy (kWh):	42
Energy density (Wh/kg):	>170
C-rate (continuous):	1C (charge) 2C (discharge)
Cathode technology:	NMC
Protection:	IP68 / IP6K9K
Life cycles:	>4,000 at 80% DoD
Weight (kg):	250
Regulation compliance:	ECE R100.3/R10.6
BMS:	Microvast

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